modern adaptation, where the teeth acquire retrograde characters on account of foodstuffs being prepared so as to require minimum effort. Such changes are closely correlated with those of modes of life, the two contrasting poles of which are the arboreal and the domesticated forms, also conditioning very decided changes in skeletal adaptation. The retraction of the face and the loss of the prehensile character of the hallux are the most significant ones.

Dr. Gregory's book is a distinguished example of the approach of phyletic problems by minute and comparative description, supported by explanatory illustrations. He consciously does away with methods of more exact representation by means of diagrammatic and mathematical devices. That such a solution is possible to a fair degree in a field of investigation dealing mostly with transitory fossil forms in view of a, for the time being, fixed biological final form, as represented by man in the phyletic sense, is fully shown in the author's work. It is in fact the most conscientious, resourceful and up-to-date comprehensive work, containing a wealth of acute morphological observations and clever deductive argumentation, that has come to my knowledge for some time. A few disdainful remarks on sciences that have to rely to some degree on exact methods, preeminently anthropology itself (pp. 250, 333, 341) cannot detract from the distinct value of his exposition. They only serve to show, besides forming an unnecessary diversion, a fatal miscomprehension of the object and view of anthropology, whose chief task consists in analyzing a living form, as it were, even if it refers to historically extinct races. That this has to be accomplished with a consideration of all the biological perspectives that pertain to man's physical existence goes without saying. Paleozoological endeavors must naturally cease on the threshold of this science with its complexity of phenomena, but their excellent work in tracing the phyletic connections of man's ancestors should be appreciated without reservation, especially in the work here reviewed.

BRUNO OETTEKING

MISCELLANEOUS

The Turquois. A Study of its History, Mineralogy, Geology, Ethnology, Archeology, Mythology, Folklore, and Technology. JOSEPH E. POGUE. (Memoirs of the National Academy of Sciences, Vol. XII, Part II, third memoir, Washington, 1915), 162 pp, 22 plates, one of which is colored, and 1 frontispiece in colors. 30×24 cm.

This splendid publication, the fruit of many years of assiduous and

painstaking research, is perhaps the most complete monograph that we possess on any precious or half-precious stone. In eight chapters, Dr. Pogue treats of the history of turquois, its mineralogical properties, its geographical distribution, its origin and use, the chalchihuitl question, finally the importance of the stone in mythology and folklore, and its technology. A carefully drawn-up bibliography and a good index complete the volume.

It is certainly impossible for the reviewer, who is not a mineralogist, to review the mineralogical portion of the work; he must restrict himself to offering a few remarks on the history of our knowledge of the turquois. With a great amount of industry Dr. Pogue (pp. 9 *et seq.*) has lined up sources and pseudo-sources relating to real and alleged turquois in ancient times, but the history of the subject in Europe is not worked out with desirable lucidity. Galenus (pp. 12, 35) must decidedly be eliminated from the list of ancient authors who mention the turquois of Nīshāpūr in Persia, for this statement emanates only from Ibn al-Baiṭār (1197–1248) and ranks on the same level with all other data attributed by Arabic authors to Aristotle or Galenus. Galenus, of course, never discussed the turquois, still less could he speak of Nīshāpūr, as this city, founded by Shāpūr II (A.D. 309–379), did not yet exist in his lifetime (A.D. 129–199). No Greek author mentions the turquois or any stone that might be interpreted as such; above all, Dioscorides is reticent about it. The only ancient author who has been credited with a knowledge of turquois is Pliny; but in the reviewer's opinion Pliny's *callaina* and *callais*, which have been taken as such, in fact, have nothing to do with the turquois. Dr. Pogue also feels that the alleged correspondence is far from satisfactory. There is an excellent criterion that may guide us in identifying Plinian stones, and this is the perpetuity of tradition in the East and West alike, as has been shown, for instance, by the writer in the case of the diamond. The Plinian tradition in regard to the stone *callaina* is perfectly isolated, however, and was not taken up, reproduced, or continued, by any Oriental or Occidental mineralogists. The Arabic records regarding turquois make no reference whatever to classical authors, as they do in regard to so many other stones, but are plainly traditions which originated in the Orient itself. Pliny's successors, first of all, C. Julius Solinus, who has adopted nearly the complete list of his precious stones, and has contributed much to hand their knowledge down to the middle ages, has passed the *callaina* over in silence; indeed, he does not mention any stone that could be interpreted as the turquois. In accordance with this fact, the French Bishop Marbodus (1035–1123), in his *De lapidibus*

pretiosis, is also silent in regard to the subject. Likewise the early French and German stone-books do not mention the turquois. Dr. Pogue (p. 12) informs us, however, that Isidorus of Sevilla (*circa* 570–636), in book 16 of his *De natura rerum*, alludes to the frequent use of turquois in the ears of Orientals. Unfortunately the source for this statement is not cited, while in all other cases Dr. Pogue very conscientiously quotes his authorities. Isidorus' work *De natura rerum* deals with cosmography and geography and consists of a single book, divided into forty-eight brief chapters. Chapter XVI treats *de quantitate solis et lunae* and contains nothing about the turquois or any other precious stone, nor does the remainder of the work. It is equally doubtful to me whether the definition of the turquois taken from an anonymous and undated Latin *lapidarium* (p. 13) can be really attributed to Albertus Magnus (1193–1280), as Dr. Pogue inclines to think. Albertus Magnus has written a treatise *De virtutibus lapidum*, inserted in his work *De secretis mulierum item de virtutibus herbarum lapidum et animalium* (the edition before me was published at Amsterdam, 1669); the turquois does not occur there, and here was the occasion to deal with it if Albertus had known it. Knowledge of the turquois in Europe did not spread earlier than during the thirteenth and fourteenth centuries. Du Cange (*Glossarium mediae et infimae latinitatis*) quotes a document dated 1347 as the oldest source for the word *turchesius* or *turcica gemma*. According to the *New Oxford English Dictionary* the earliest reference to turquois in English literature occurs in a work of 1398. We meet it also in the famous list of stones enumerated in Wolfram von Eschenbach's *Parcival* (791, 18). The Dictionary of the Spanish Academy (*Diccionario de la lengua castellan*, vol. VI, p. 379, Madrid, 1739) quotes as the earliest author to mention turquois (*turquesa*) Gomez de Tejada in his *Leon Prodigioso*. The earliest European writer revealed by Pogue is Arnoldus Saxo in his *De virtutibus lapidum*, where the stone is described as of a yellow color, verging on white. The question as to why the stone is called yellow is not discussed by Pogue, but this error surely testifies to the fact that these medieval writers knew the stone merely from hearsay. The statement of the early English author of 1398 is identical with that of Saxo and apparently derived from him. His text runs thus:

> Turtogis that hatte Turkeis also is a yelow white stone and hath that name of the contrey of Turkeis. This stone kepeth and saueth the siyt and bredeth gladnes and comforte.

The derivation of the name of the stone from Turkey leaves no doubt that the first knowledge of it was transmitted from that quarter; and it is

further evident that European medieval knowledge of the stone hailed directly from the Orient, and was not connected with any tradition of classical antiquity. Consequently, the question as to whether Pliny knew the turquois or not, is irrelevant, as the subsequent generations owed him nothing along this line, but derived their knowledge exclusively from Oriental peoples.

The callean stone (καλλεανὸς λίθος) mentioned in the *Periplus* has no relation to Pliny's *callaina*. The identification of the two names rests on bad philology. It is quite certain that the term of the *Periplus* goes back to a Sanskrit prototype of the form *kalyāṇa* and means "excellent stone," or may refer to the city Kalyāṇa near Bombay, mentioned by Cosmas Indicopleustes under the name Kalliana (see Burnell, *Indian Antiquary*, vol. III, p. 310). It is equally certain that at the end of the first century A.D., when the *Periplus* was written, the turquois was wholly unknown in India and in all probability even in Iran. It was only the Mohammedans who introduced the stone into India, not earlier than the latter part of the tenth century.

Garcia da Orta in his *Coloquios do simples e drogas* (Goa, 1563) was the first to introduce the Arabic-Persian term in the forms *ferruzegi* and *puruza*, as he writes, and to interpret it correctly as the turquois, simultaneously refuting the previous error that this word should refer to the emerald. It was known to him that there was a great quantity of turquois in Persia, and with regard to its medicinal employment he comments that he was told by some people that it figures in the pharmacopeia among the Gentios (that is, Hindu), by others, however, that it does not. Among the Moors (that is Mohammedans) all say that it is used in medicine (see C. Markham, *Colloquies on the Simples and Drugs of India by Garcia da Orta*, pp. 358–359). In fact, the medical utilization of the stone originated among the Mohammedans of western Asia, who introduced the practice into India. Garcia's statement shows that in the latter part of the sixteenth century the turquois was not yet officially admitted into the pharmacopeia of India, and that its medical employment was reduced to a minimum.

In regard to the antiquity of the turquois in Iran and the history of the mines of Nīshāpūr I feel obliged to maintain strictly my former position in this question, and am not convinced by Dr. Pogue's purely speculative considerations to the contrary (p. 35). The point in historical problems is not what might have been, but what has been, and only facts and data carry convincing force. It is somewhat surprising to note how Dr. Pogue can advance the statement

That the deposits were worked about 2100 years B.C., is suggested by the name of one of its openings, called Isaac's Mine on account of a tradition that it was discovered by Isaac, the father of Israel,

after I characterized this as a legend without historical value (*Notes on Turquois*, p. 42, note 2). Such modern legends connecting famous sites with names of the Old Testament exist by the thousands among the Mohammedans. In writing on the cultivation of the apple one might as well invoke Eve's apple as good evidence for the great antiquity of its cultivation.

In my *Notes on the Turquois* I dated the first acquaintance of the Chinese with the stone in the period of the Mongols, but there is now reason to believe that the latter were preceded by the Khitan (usually classified among Tungusians), who ruled China as the Liao dynasty from 907 to 1123. Officials of that dynasty are said to have worn girdles adorned with gold, jade, rock-crystal, and turquois. Thus far I have found this statement only in the *Sü wen hien t'ung k'ao*, written in 1586, but it remains to be traced in the contemporaneous records of the Liao dynasty, before it may be retained as a well-assured fact.

It is regrettable that Dr. Pogue (p. 84) has not had the opportunity of examining the alleged turquois beads found at certain neolithic stations of France and Spain. It would be interesting to see this vexed problem solved, as on the one hand we have the theory of Aveneau de la Grancière (*Les parures préhistoriques et antiques en grains d'enfilage et les colliers talismans celto-armoricains*, p. 147) that these stones were imported from the Orient in a crude state, and on the other hand the opinion of Comte de Limur that this material was brought to light from the tin mines of Montbras. A single analysis made by Damour in 1864 demonstrates that the stones in question more nearly approximate variscite; he also bestowed on it the name *callais*. As no analysis on a large scale has as yet been conducted, the evidence remains inconclusive. O. Montelius (*Chronologie der ältesten Bronzezeit*, p. 204) seems to incline toward the belief that all these beads, also those found in Spain and Portugal, are real turquois.

The author asserts that the Nile was named in reference to its blue waters from the Sanskrit word *nīla*, meaning blue (p. 110). Latin *Nilus* is the reproduction of Greek *Neilos* which either goes back to an Egyptian word, or whose origin must be regarded as obscure, but which cannot be sought for in Sanskrit. By the way it may be remarked that the development of color-sense cannot be traced from linguistic arguments, and that Geiger's study cited by Pogue (p. 68) is thoroughly antiquated, nor

is it true that Chinese lacks words for blue. Defects of color nomenclature are merely defects or limitations of language, not of color-sense.

To the bibliography may be added Robert de Berquen, *Les merveilles des Indes orientales et occidentales ou Nouveau traité des pierres precieuses et perles*, pp. 51–53 (Paris, 1669); and H. H. Hayden in *Memoirs Geological Survey of India*, vol. 36, pt. 2, 1907, p. 65 (brief reference to turquois at Lhasa).

The preceding observations bear only on some details of Dr. Pogue's monograph, and most assuredly do not detract from the intrinsic value of his magnificent work. My own limitations prevent me from rendering it full justice. It will remain a classic in the hands of all students interested in mineralogy, ethnology, and archeology, and occupy a place of honor in the publications of the National Academy. It is a cyclopedia giving an intelligent summary of all we know at present about the turquois. The attention of Americanists may be specially called to the interesting chapter on the chalchihuitl question. The illustrations are well selected, and the reproductions are excellent.

B. LAUFER

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